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The Effect of Classification on the Coefficient of Income Elasticity of Farm Family Expenditures

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by

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Preface

The effect of the basis of classification on the income-expenditure relations obtained from farm family survey data is the subject of this report. If farm family spending is customarily adjusted to the family's typical income, what indicant of economic level will yield an estimate of this typical income?

Three bases of classification, annual disposable net cash income, annual gross cash income, and a nonmonetary rating scale, were used. The initial problem was to determine the suitability of a nonmonetary rating score for use as an indicant of the farm family's economic level. Hence, the report consists of two parts. The first deals with the indicants of economic level selected for use in the methodology problem undertaken. The second deals with the basic issues of the study, the effectiveness of each basis of classification in yielding an estimate of the average income of the classes within the group that is relatively free of the year-to-year variability in income, and the relation of average family expenditures to average typical income.

This bulletin is a condensation of a Ph.D dissertation on file at the University of Chicago (1953). It was completed under the guidance and supervision of Dr. Margaret G. Reid and Dr. Hazel Kyrk. To Dr. Reid I am especially indebted for recognizing the suitability of the data for the problem investigated.

The data for this report were taken from the "Rural Spending Ways" study, a Research and Marketing Act Project sponsored jointly by the Tennessee Agricultural Experiment Station and the College of Home Economics, The University of Tennessee (R. and M. 6). The contribution of Dr. R. L. Anderson, Institute of Statistics, Raleigh, North Carolina, who designed and evaluated the sample of the "Rural Spending Ways" study, with the assistance of Mr. John Monroe, formerly at Iowa State Statistical Laboratory, Ames, Iowa, and now at the Institute of Statistics, Raleigh, North Carolina, and Mr. R. J. Freund is gratefully acknowledged.

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THE EFFECT OF CLASSIFICATION ON THE COEFFICIENT OF INCOME ELASTICITY OF FARM FAMILY EXPENDITURES

By

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INTRODUCTION

Do expenditures of farm families at high income levels differ from those at low income levels—if "high" and "low" are used in reference to the typical income levels over a period of years rather than the income level of any one year? To explore this question a basis of classification which does not register the effect of short run income change is needed.

It is a widely recognized fact that farm family income may be higher than usual one year and lower than usual the next. The nature and extent of the shift in income level from year to year differs among families. Consequently, the income that a farm family reports for a single year may not describe the family's typical income position in the group of families included in a survey. This shifting around in family income position interferes with current income as a satisfactory basis of classification for measuring the relation of family expenditures to the typical income of the family.

When farm families are classified by income for a single year, deficit spending is relatively common at low income levels and large savings at high income levels. Likewise, expenditures as a percentage of income decrease appreciably at high income levels compared with those at low income levels.

In planning expenditures, farm families probably have in mind a level of income over a period of years to which they adjust their spending. If they have a bad year with income far below their usual level, they draw on their reserves. If they have an exceptionally good year they save more than usual and add to their reserves. Consequently, the ups and downs from year to year in family spending do not move with income.

The basis of classification selected for ranking farm families affects the grouping or combination of families in the respective classes used in the analysis of income-expenditure data. The shifting in income position from year to year is presumed to be a limitation of the classication by current annual income that interferes with revealing differences in expenditures between "low" and "high" income families. If the average income of the respective classes is to be free from the effect of the year-to-year variation in income among families, the basis of classification must have certain characteristics: (1) a positive correlation with the typical income of the families, and (2) no correlation with the differences among families in the year-to-year variation in income.[1] Such a basis of classification may facilitate a better understanding of the relation of average income and average family expenditures than the classification by current net income does.

Appraisal of three bases of classification in terms of the characteristics enumerated above is the objective of this study. The method of test includes (1) measurement of the rate of increase in average family expenditures with the increase in average current net income when a group of farm families is classified by disposable net cash income reported for the survey year, and (2) comparison of such expenditure-income relations with those obtained when the families are classified by two other indicants of economic level. These are annual gross cash income and family status measured by Sewell's Short Form of the Farm Family Socioeconomic Status Scale.[2] It is assumed that the grouping of families by these indicants will yield average incomes that are relatively free from the effect of the year-to-year variability in income.

The indicants of economic level other than annual net income selected for exploration are discussed separately to point out their anticipated merits and explain the precautions taken to prevent undue criticism of their use. The methodology of the study constitutes a large portion of the report. It is hoped that an adequate explanation of the procedures followed will facilitate the readers' understanding and appraisal of the findings.

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[1]For an extended discussion of income characteristics, see M. Friedman and S. Kuznets, **Income from Independent Professional Practice** (New York: National Bureau of Economic Research, 1945), pp. 325-338.

[2]William H. Sewell, "A Short Form of the Farm Family Socioeconomic Status Scale," **Rural Sociology,** VIII (June 1943), 166.

SOURCE OF DATA

This study is based on data reported by 108 relatively homogenous Tennessee farm families constituting a subsample of 331 white owner-operator farm families who cooperated in a state-wide survey conducted in 1950. The latter was entitled "Rural Spending Ways." The survey sample was designed to select according to the laws of probability a sample of white owner-operator farm families of a specified composition living in the open country of Tennessee and to secure a self-weighting sample. An appraisal of the sample indicated there were no wide discrepances between the survey and the 1950 Census of Agriculture. The sample for the state-wide survey was designed, drawn, and evaluated under the supervision of qualified statisticians.

By virtue of the criteria used to select the subsample only farm operators under 55 years of age who had less than 100 days off-farm work, no nonfarm business, a positive net cash income, and 50 per cent or more of the family income from farming operations were included, and only the families of these selected operators with not more than 6 year-equivalent persons who had no relatives as family members apart from their own unmarried children under 22 years of age and who had less than $600 in expenditures for medical care were retained for this special investigation.

The criteria defined for the selection of the subsample were intended to reduce the heterogeneity in both income and expenditures. The factors affecting income which were controlled were the amount and type of nonfarm income and expense for medical care. The mixture of farm and nonfarm income was limited for two reasons: (1) because of its effect on the ranking of families by gross cash income, and (2) because of its effect on the disposable net cash income obtained out of a classification by gross cash income. Medical expense was restricted to prevent adverse effects on income due to the incapacity of earners. The expenditures of families are known to be influenced by the age, size, and composition of the family; hence, these factors were controlled.

Income and expenditure data were obtained for the calendar year, 1949, as well as information required to give each family a socioeconomic status score on Sewell's Short Form of the Farm Family Socioeconomic Status Scale at three points in time; namely, the date of interview, summer 1950; the end of the report year, December 31, 1949; and the beginning of the report year, January 1, 1949.

PART I

INDICANTS OF ECONOMIC LEVEL

GROSS CASH INCOME AS A BASIS OF CLASSIFICATION

Some early researchers who were dissatisfied with net cash income as a basis of classification for the study of farm family spending ability used gross cash income. The assumption was that the competition of expenditures for farm production and for family living within a family budget in a given year was experienced in terms of the use of total cash receipts rather than net cash income. A similar premise was used by Longmore and Taylor in their recent study of the elasticity of expenditures in relation to gross cash income.[3] However, the relationship of average expenditures for family living and the average net cash income out of the gross cash income was not investigated by these researchers.

The effect of a mixture of farm and nonfarm income on the ranking of families by annual gross cash income was recognized by Lively, an early investigator of farm family income-expenditure relations.[4] In a study of Ohio farm families he found that 16 per cent of the gross cash receipts were from nonfarm sources and that the nonfarm income was largely concentrated in the lower income levels. A mixture of farm and nonfarm income also affects the net cash income obtained out of the classification by gross cash income. If nonfarm income from wages and salaries is an important part of the total gross cash income, families with this combination are likely to rank low in the gross cash income classification but to have a relatively high net cash income as compared with families having the same gross cash income derived primarily from farming. The latter includes a larger proportion of farm operating expense than the former, and so tends to yield a relatively low net cash income. If the nonfarm income is derived from a nonfarm business, the difference in rank by total gross cash income and by net cash income of such families may be quite large since the gross cash income includes the operating expense of two business units. Hence, knowledge of the composition of gross cash income is essential if it is to be used as the basis of classification for the study of farm family income-expenditure relations. In the investigation being reported only families who obtained 50 per cent or more of their family income from farming were included.

The gross cash income of farm families probably varies less from time to time than their net cash income. Some of the variance in the

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[3] T. W. Longmore and C. C. Taylor, "Elasticity of Expenditures for Farm Family Living, Farm Production, and Savings, United States, 1946," **Journal of Farm Economics,** XXXIII (February 1951), 1-19.

[4] Charles E. Lively, "Relation of Net Cash Receipts and Expenditures for Family Living," **Ohio Agricultural Experiment Station Bimonthly Bulletin,** No. 140 (September-October 1929), pp. 174-175.

latter caused by the deduction of farm operating expense is not reflected in gross cash income. In this study it is assumed that the tendency towards stability of annual gross cash income may enhance its suitability as a basis of classification to pre-sort farm families for a study of the relation of their typical income and family expenditures.

FAMILY STATUS, A NONMONETARY RATING, AS A BASIS OF CLASSIFICATION

Nonmonetary scales in lieu of income were used to classify individual farm families in several recent investigations.[5] However, the number of studies using both a nonmonetary rating and income as a basis of classification is limited.[6] Consequently, knowledge of the interrelation of scale scores and annual money income is limited. One investigation concerned with the relation of current net money income and socioeconomic status scores of farm families in five Southern states concluded that the relationship was not great enough to use the scale score as a means for predicting current net money income of individual families.[7] If current income were predictable from socioeconomic status scores, then the latter would not be suitable as a basis of classification for the purpose of this study because it is generally believed that income varies from year to year and that current income is only moderately correlated with typical income. The author's reasons for selecting Sewell's scale and an analysis of certain characteristics are given prior to a discussion of the tests made.

Choice of Sewell's Scale[8]

Information about Sewell's scale which is pertinent to the present investigation was available from recent researches.

A Southern Regional study, which used the Short Form of the Farm Family Socioeconomic Status Scale, provided evidence that socioeconomic status scores and current net money income for 1947 were significantly correlated but not highly correlated.[9] Item analysis showed that the differentiating capacity of the scale was clearly related to the economic items. Of the fourteen items on the scale eleven were significantly correlated with income for white owner-operator families. Two, the social participation items, were uncorrelated with

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[5] **Housing Needs of Western Farm Families** (Western Cooperative Series Research Report No. 1; Corvallis, Oregon: Oregon Agricultural Experiment Station [and others] 1952); **Farm Housing in the South** (Southern Cooperative Series Bulletin No. 14; Knoxville, Tennessee Agricultural Experiment Station [and others] 1951).

[6] **Family Food Consumption in Three Types of Farming Areas of the South. I. An Analysis of 1947 Food Data; II. An Analysis of Weekly Food Records Late Winter and Early Spring, 1948** (Southern Regional Series Bulletin No. 7 and No. 20; Knoxville, Tennessee; Tennessee Agricultural Experiment Station [and others] June 1950 and November 1951).

[7] M. J. Harris and J. Staab, "The Relationship of Current Net Income to the Socioeconomic Status of Southern Farm Families," **Rural Sociology,** XVI (December 1951), 358.

[8] See Appendix for replica of Sewell's scale used in this study.

[9] Harris and Staab, **loc. cit.**

current net money income for six race-tenure groups. One additional item, the radio, was uncorrelated with income for owner-operator families because most of them had a radio.[10]

One of the conclusions of the investigators using factor analysis on the Belcher revision of Sewell's scale is as follows:

> Since the first common factor in the Sewell scale does not reflect social participation but material and cultural possession, which two variables Sewell assumed measured effective income, it was concluded that the first component in the Sewell scale may accurately be labeled "level of living." Thus, the Sewell scale is a measure of level of living rather than socio-economic status.[11]

Restandardization of Sewell's original scale in 1947, ten years after its construction, confirmed the differentiating capacity of the scale as a whole even though some of the individual items had lost their differentiating power.[12] A similar conclusion regarding the short form of Sewell's scale which is a brief form of the original scale seems reasonable.

Characteristics of Sewell's Scale

Two characteristics of the scale of special interest to this investigation are: (1) the expenditures implicit in the scale and (2) the nature of the time-to-time variance in socioeconomic status ratings.

Exclusion of Expenditures for Scale Items[13]

The expenditures implicit in Sewell's scale are of two types: (1) the maintenance and operating cost directly related to the items included in the scale, and (2) the acquisition cost of items not previously possessed but purchased during the year of the study. These expenditures represented 18.5 per cent of total family expenditures. One would expect, therefore, to find a spurious correlation between total family expenditures, the dependent variable, and classification by socioeconomic status, the independent variable.

The plan of analysis adopted to eliminate the component in the scale which might affect the results of the study was to use three cate-

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[10]Mary Ellen Jordan, "The Relationship of Current Net Income to Socioeconomic Status" (Unpublished Master's Thesis, Department of Experimental Statistics, University of North Carolina, Raleigh, 1949), p. 23.

[11]J. C. Belcher and E. F. Sharp, **A Short Scale for Measuring Farm Family Level of Living: A Modification of Sewell's Socio-Economic Scale,** Oklahoma Agricultural and Mechanical College, Oklahoma Agricultural Experiment Station Technical Bulletin No. T-46 (Stillwater, 1952), p. 22.

[12]John C. Belcher, "Evaluation and Restandardization of Sewell's Socio-economic Scale," **Rural Sociology,** XVI (September 1951), 246.

[13]A distinction was made in the use of current funds for items on Sewell's scale. Outlays for installation of electricity or telephone and dwelling improvements were treated as consumer investments or savings. All other cash outlays, hereinafter referred to as "scale items," were treated as expenditures and designated as a separate category. See definition of terms for expenditures included.

gories of expenditures: (1) total family expenditures, (2) expenditures for the "scale items," and (3) "residual" family expenditures or the remainder after expenditures for the "scale items" were excluded from total family expenditures. Presumably, the category "residual" family expenditures would be free of the expenditures implicit in the scale and, therefore, a better measure of the relationship of family expenditures and socioeconomic status than total family expenditures.

Constancy of Ranking by Socioeconomic Status

The kind and amount of variance in socioeconomic status was explored by examining the extent to which shifting of a family's relative socioeconomic position within the group occurred during a specific time span.

Classification by socioeconomic status at three points in time, January 1, 1949; December 31, 1949; and the date of interview, summer of 1950, revealed that 61 families increased their socioeconomic score and 36 families shifted from one socioeconomic class to another during this eighteen months' period. Seventeen families raised their quarter position. Of these, 15 moved to the next highest quarter while 2 moved up two classes from the second to the fourth quarter. As a result of these changes in an upward direction, 19 families were displaced and, therefore, had a lower quarter position on the date of interview than on January 1, 1949, even though 3 of these families had newly acquired items which increased their socioeconomic score.

These findings indicate that the time-to-time variance in socioeconomic status is not of the transitory type—up one year and down another. The level of socioeconomic status for the group as a whole increased without much shifting in the relative socioeconomic position of the families within the group.

SOCIOECONOMIC STATUS, AN INDICANT OF ECONOMIC LEVEL

The suitability of socioeconomic status as an indicant of the farm family's economic level was determined by a variety of tests. On individual family data the coefficient of rank correlation was used to measure the relation of family expenditures and each basis of classification. The coefficient of rank correlation was also used to ascertain the effect of different points in time on the relation of socioeconomic status and family expenditures. On grouped family data two tests were made: One, analysis of variance, to determine whether the average expenditures of the respective quarters within the distribution differed with the basis of classification; the other, the ratio increase in expenditure, to see if the pattern of expenditures varied with the basis of classification. This test, also, was extended to determine what differences, if any, in the pattern of expenditures were associated with socioeconomic status at different points in time.

Rank Correlation of Family Expenditures and Three Indicants of Economic Level

The assumption is that farm families customarily adjust their expenditures to their typical income; hence, the higher the coefficient of rank correlation of family expenditures in relation to income or socioeconomic status the higher its correlation with typical income.[14]

Each basis of classification and total family expenditures was significantly correlated; and the difference among the coefficients, socioeconomic status .74, gross cash income .79, and disposable net cash income .73 was not significant (see Table 1). Likewise, the expenditures for the "scale items" and each indicant of economic level were significantly correlated, and there was no significant difference among these coefficients, but the variation in magnitude is of interest. Socioeconomic status yielded the highest coefficient which conforms with expectation since the expenditures for the "scale items" increased the magnitude of this category at the same time that it increased the socioeconomic status score of some families. The difference between the coefficients for gross and disposable net cash warrants attention because it is the same pattern of relationships which emerged for total family expenditures and these two types of cash income. The magnitude of the coefficients of "residual" family expenditures indicates that the spurious correlation of expenditures for the "scale items" and classification by socioeconomic status can be ignored.

TABLE 1—*Rank Correlation Coefficients of Family Expenditures and Three Indicants of Economic Level.*

Indicants of Economic Level (1)	Expenditures for Scale Items (2)	Residual Family Expenditures (3)	Total Family Expenditures (4)
Socioeconomic Status	.53	.73	.74
Gross Cash Income	.48	.81	.79
Disposable Net Cash Income	.42	.74	.73

Rank Correlation of Family Expenditures and Socioeconomic Status at Three Points in Time

The expenditures for the "scale items" and socioeconomic status at different points in time were significantly correlated, but there was no significant difference among these coefficients (see Table 2). The

[14]The technique of rank correlation was used because the differentiating capacity of the indicants varied.

variation seems reasonable in view of the known characteristics of the scale. The difference between the coefficients for the beginning and the end of the report year indicates the intercorrelation of the expenditures for the "scale items" and socioeconomic status. The difference between the coefficients for the date of interview and the end of the report year indicates the extent to which this intercorrelation is dampened by an increase in socioeconomic status and the omission of these expenditures.

TABLE 2—*Rank Correlation Coefficients of Family Expenditures and Socioeconomic Status at Three Points in Time.*

Socioeconomic Status at Three Points in Time (1)	Expenditures for Scale Items (2)	Residual Family Expenditures (3)	Total Family Expenditures (4)
Date of Interview, 1950	.53	.73	.74
December 31, 1949	.57	.72	.74
January 1, 1949	.40	.68	.65

The similarity in the coefficients of "residual" family expenditures and socioeconomic status at different points in time cannot be explained as a spurious correlation because the expenditures for the "scale items" were excluded from this category of expenditures. Both the magnitude and the similarity of the correlation coefficients of "residual" family expenditures tend to increase confidence in socioeconomic status as an indicant of economic level.

Analysis of Variance in Average Expenditures of Families Arrayed by Three Indicants of Economic Level[15]

To determine the effect of classification on average expenditures the families were sorted into four classes of equal size by: (1) disposable net cash income, (2) gross cash income, and (3) socioeconomic status. Differences among the average expenditures of the respective classes were then examined.

[15]Two categories of expenditures, total and food, were standardized to 3.71 persons, which was the average number of persons per family in the subsample. Standardization scales developed by Dorothy S. Brady of the U. S. Bureau of Labor Statistics were used. A preliminary examination of the data for the Tennessee farm families indicated the scales were suitable for removing the effect of family size in estimating the relation of income to expenditures. Total family expenditures were adjustd by using the ratio of the sixth root of the family size of the class to the average family size of the subsample. Food expenditures were adjusted by using the ratio of the cube root of the family size. See D. S. Brady and H. A. Barber, "The Pattern of Food Expenditures," **Review of Economics and Statistics,** XXX (August 1948), 198-206.

Use of these scales with a relatively homogeneous group of families may not be in complete accord with the logic of the scales developed on the basis of the size and customary groupings of children and adults in a heterogeneous group of families. The results of this study would not have been different if the average expenditures of the class as reported had been used because the magnitude of the adjustment in the various classes was very small.

Two breakdowns of total family expenditures were used. One was essential to the structure of the analysis, namely, "residual" family expenditures and expenditures for "scale items" (see Table 3). The other was selected categories of goods and services, namely, food, clothing, recreation, gifts and contributions, and all other (see Table 4).

At the 5 per cent level of confidence, the "F" test showed no significant difference in the average total family expenditures of the respective classes when the families were ranked by the three indicants of economic level. Neither were there any significant differences in the average expenditures for the various categories into which total family expenditures were divided. Since analysis of variance provided no evidence that the basis of classification caused a significant difference in the average expenditures of the respective classes, the average expenditures of the families composing the classes at the extremes of each distribution were examined to determine what difference, if any, existed.

Ratio Increase in Average Expenditures of Families Arrayed by Three Indicants of Economic Level

The ratio increase of average expenditures of the fourth quarter over the first was calculated with average expenditures of the first quarter equal to 100 per cent.

For the classification by socioeconomic status and by gross cash income the ratio increase in average total and "residual" family expenditures was similar and appreciably higher than for the classification by disposable net cash income (see Table 3). The ratio increase in average expenditures for the "scale items" was considerably higher for the classification by disposable net cash income than by gross cash income, but neither of these showed as high a ratio increase as the classification by socioeconomic status. The spurious correlation between expenditures for the "scale items" and socioeconomic status was again evidenced.

In four out of five selected categories of goods and services the ratio increase in expenditures was highest for the classification by socioeconomic status and lowest for the classification by disposable net cash income. The ratio increase in expenditures for the classification by gross cash income tended to be similar to those for the classification by socioeconomic status (see Table 4). In the remaining category, clothing, the ratio increase was highest for the classification by disposable net cash income and may be explained by family size. The average size of family in the fourth quarter of the distribution by disposable net cash income was larger than in the first quarter while the converse was true of families classified by gross cash income and by socioeconomic status. No adjustment was made in clothing expenditures for differences in average family size (see Table 3).

TABLE 3—*Average Disposable Net Cash Income, Family Expenditures, Family Size, and Socioeconomic Score by Three Indicants of Economic Level.*

Indicants of Economic Level	Average Disposable Net Cash Income	Average Family Expenditures					Average Number of Persons Per Family	Average Socio-economic Score
		Total		Residual		Scale Items		
		As Reported	Adjusted to Family of 3.71 Persons*	As Reported	Adjusted to Family of 3.71 Persons*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First Quarter								
Socioeconomic score	951	815	802	693	682	122	4.10	57.7
Gross cash income	656	788	783	629	625	158	3.89	61.0
Disposable net cash income	590	834	837	677	680	157	3.66	62.9
Second Quarter								
Socioeconomic score	1505	1195	1204	925	932	270	3.56	69.0
Gross cash income	1359	1117	1112	888	884	229	3.82	68.0
Disposable net cash income	1226	1161	1154	937	931	224	3.88	69.6
Third Quarter								
Socioeconomic score	2012	1391	1388	1172	1169	219	3.79	74.5
Gross cash income	2105	1585	1601	1340	1353	245	3.52	73.9
Disposable net cash income	2049	1539	1552	1321	1331	219	3.55	73.2
Fourth Quarter								
Socioeconomic score	3054	2441	2478	1959	1989	482	3.39	83.7
Gross cash income	3402	2352	2364	1891	1900	461	3.61	82.0
Disposable net cash income	3658	2307	2304	1814	1811	493	3.75	79.2
Average of Fourth Quarter Over First Quarter: First Quarter = 100								
Socioeconomic score	321	300	309	283	292	395	—121	145
Gross cash income	519	298	302	301	304	292	—108	134
Disposable net cash income	620	277	275	268	266	314	+103	126

*See page 13 for adjustment procedure used.

TABLE 4—*Average Disposable Net Cash Income and Average Expenditures For Selected Categories By Three Indicants of Economic Level.*

Indicants of Economic Level	Average Disposable Net Cash Income	Average Family Expenditures						
		Food			Clothing	Recreation	Gifts and Contributions	All Other
		Total As Reported	As Reported	Adjusted to Family of 3.71 Persons*				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First Quarter								
Socioeconomic score	951	815	272	263	162	13	24	344
Gross cash income	656	788	264	260	146	13	23	342
Disposable net cash income	590	834	271	272	141	18	26	378
Second Quarter								
Socioeconomic score	1505	1195	332	337	214	22	44	583
Gross cash income	1359	1117	324	321	228	19	41	504
Disposable net cash income	1226	1161	333	328	218	19	62	529
Third Quarter								
Socioeconomic score	2012	1391	337	334	273	23	68	690
Gross cash income	2105	1585	394	401	263	33	92	803
Disposable net cash income	2049	1539	371	377	287	33	79	769
Fourth Quarter								
Socioeconomic score	3054	2441	527	543	388	82	207	1237
Gross cash income	3402	2352	484	489	399	76	187	1206
Disposable net cash income	3658	2307	492	490	391	70	177	1178
Average of Fourth Quarter Over First Quarter: First Quarter = 100								
Socioeconomic score	321	300	194	206	240	631	862	360
Gross cash income	519	298	183	188	273	585	813	353
Disposable net cash income	620	277	182	180	277	389	681	312

*See page 13 for adjustment procedure used.

Ratio Increase in Average Expenditures of Families Arrayed by Socioeconomic Status Ratings at Three Points in Time

On the date of interview and at the end of the report year, the ratio increase in average total family expenditures was nearly the same and considerably higher than that for the classification by socioeconomic status at the beginning of the report year (see Table 5). Differences in the ratio increase in average expenditures for the "scale items" associated with the three points in time were as expected on the basis of the known characteristics of the scale.

The behavior of "residual" family expenditures is of particular importance because this category is free of the direct influence of expenditures during the report year that affect socioeconomic status. The progressive rise in the relative magnitude of the ratio increase in "residual" family expenditures indicates that socioeconomic status had an indirect effect on family expenditures. Once the "scale items" were acquired and became a fixed part of the manner of living, "residual" family expenditures tended to rise.

The nature of the goods and services consumed at different points in time tends to vary with socioeconomic status. The ratio increase in average expenditures for food and recreation was highest at the date of interview, for clothing and "all other" expenditures the increase was greatest on December 31, 1949, and for gifts and contributions the increase was largest on January 1, 1949 (see Table 6).

The explanation for the differences in the ratio increase in the average expenditures for clothing associated with different points in time does not seem to be family size. The category, "all other" expenditures, which includes most of the outlays for the "scale items," conforms with expectation and shows a maximum increase at the end of the report year. In the other four categories the difference in the ratio increase in average expenditures may reflect the indirect effects of the change in socioeconomic status and may be indicative of the types of adjustments made among the various categories of family expenditures.

TABLE 5—*Average Disposable Net Cash Income, Family Expenditures, Family Size, and Socioeconomic Score By Socioeconomic Status Ratings at Three Points in Time.*

Socioeconomic Status at Three Points in Time	Average Disposable Net Cash Income	Average Family Expenditures					Average Number of Persons per Family	Average Socioeconomic Score
		Total		Residual		Scale Items		
		As Reported	Adjusted to Family of 3.71 Persons*	As Reported	Adjusted to Family of 3.71 Persons*			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First Quarter								
Date of interview	951	815	802	693	682	122	4.10	57.7
December 31, 1949	907	810	799	705	695	105	4.06	55.3
January 1, 1949	1013	866	850	715	702	151	4.17	50.5
Second Quarter								
Date of interview	1505	1195	1204	925	932	270	3.56	69.0
December 31, 1949	1699	1222	1208	969	958	253	3.98	67.9
January 1, 1949	1490	1265	1274	962	969	303	3.57	64.8
Third Quarter								
Date of interview	2012	1391	1388	1172	1169	219	3.79	74.5
December 31, 1949	1859	1377	1396	1144	1160	233	3.44	73.4
January 1, 1949	2044	1386	1393	1190	1196	196	3.61	71.4
Fourth Quarter								
Date of interview	3054	2441	2478	1959	1989	482	3.39	83.7
December 31, 1949	3057	2433	2476	1931	1966	501	3.35	83.2
January 1, 1949	2975	2324	2351	1882	1903	442	3.48	81.3
Average of Fourth Quarter over First Quarter: First Quarter = 100								
Date of interview	321	300	309	283	292	395	—121	145
December 31, 1949	337	300	310	274	283	477	—121	150
January 1, 1949	294	268	277	263	271	293	—120	161

*See page 13 for adjustment procedure used.

TABLE 6—*Average Disposable Net Cash Income and Average Expenditures For Selected Categories By Socioeconomic Status Ratings at Three Points in Time.*

Socioeconomic Status at Three Points in Time	Average Disposable Net Cash Income	Average Family Expenditures						
		Food			Clothing	Recreation	Gifts and Contributions	All Other
		Total As Reported	As Reported	Adjusted to Family of 3.71 Persons*				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
First Quarter								
Date of interview	951	815	272	263	162	13	24	344
December 31, 1949	907	810	302	293	146	15	22	325
January 1, 1949	1013	866	297	285	147	15	19	388
Second Quarter								
Date of interview	1505	1195	332	337	214	22	44	583
December 31, 1949	1699	1222	314	306	251	23	44	590
January 1, 1949	1490	1265	326	330	236	23	53	627
Third Quarter								
Date of interview	2012	1391	337	334	273	23	68	690
December 31, 1949	1859	1377	349	358	249	23	71	685
January 1, 1949	2044	1386	366	369	279	27	80	634
Fourth Quarter								
Date of interview	3054	2441	527	543	388	82	207	1237
December 31, 1949	3057	2433	503	520	390	80	206	1253
January 1, 1949	2975	2324	479	489	374	75	191	1205
Average of Fourth Quarter Over First Quarter: First Quarter = 100								
Date of interview	321	300	194	206	240	631	862	360
December 31, 1949	337	300	167	177	267	533	936	386
January 1, 1949	294	268	161	172	254	500	1005	311

*See page 13 for adjustment procedure used.

SUMMARY: THREE BASES OF CLASSIFICATION AS INDICANTS OF ECONOMIC LEVEL

The magnitude of the rank correlation coefficients of "residual" family expenditures and each basis of classification provides evidence (1) that each of these methods of ranking farm families had some positive correlation with the family's typical income, (2) that socioeconomic status was as good a measure of the farm family's economic level as gross cash or disposable net cash income for a single year, and (3) that socioeconomic status was no better than disposable net cash income for a single year as an indicant of the farm family's typical income.

Each basis of classification meets the first of the two requirements (see page 6) for a basis of classification which should yield a measure of the typical or average income of families composing the various classes within a group. The extent to which each basis of classification meets the second requirement is the subject of Part II.

The similarity of the rank correlation coefficients of "residual" family expenditures and socioeconomic status at three points in time indicates the variance in the classification by socioeconomic status was small and tends to differ from that associated with the classification by income for a single year.

The lack of a significant difference in the average expenditures of families composing the respective classes within each distribution as shown by analysis of variance provides evidence that the basis of classification caused no significant rearrangement of families by expenditures.

Although the ratio increase in average expenditures differed somewhat with the basis of classification, it was not sufficient to cause a significant difference in the average expenditures of the classes at the extremes of the three distributions.

PART II

THE EFFECT OF CLASSIFICATION ON THE COEFFICIENT OF INCOME ELASTICITY OF FARM FAMILY EXPENDITURES

BACKGROUND OF THE PROBLEM

The income elasticity of farm family expenditures continues to be of great interest to researchers because studies of farm family spending in relation to net income differ in their findings. Cochrane and Grigg concluded from an analysis of data for two relatively homogenous groups of Corn-Belt farm families that "the elasticities of expenditures for consumer goods and services are extremely inelastic—that is unresponsive to changes in income."[16] In contrast Reid hypothesizes from an analysis of Consumer Purchases data for a selected type of farm families in four areas of the United States that:

> . . . differences among groups of families in coefficients of elasticity of expenditures in relation to annual income are in large measure due to differences among such families in year-to-year variation of relative income status[17]

The lack of agreement in the results obtained by these investigators may be due to one or more differences: (1) that they did not use the same concept of net income as a basis of classification; (2) or that if they used the same concept, its suitability as an indicator of economic level differed; (3) or that some other factor was operative.

Annual net cash income used as a basis of classification has frequently been defined as gross receipts less current operating expense, exclusive of capital investment. Efforts to identify the concept of net income which is most directly related to family expenditures have focused attention on the concept and the factors affecting the accuracy with which a given concept of net income is measured. Even if all the accounting problems could be surmounted and complete accuracy in determining the net cash income could be achieved the major limitation of ranking farm families by net cash income would still remain—its variability from year to year. The combination of shifts in the two variables, gross receipts and farm operating expense, affects the level of net cash income for any given year. If the variation in one is greater than in the other, the result is atypical net cash

[16]W. W. Cochrane and M. D. Grigg, **The Changing Composition of Family Budgets for Selected Groups of Corn Belt Farmers, 1940-42,** U. S. Department of Agriculture, Bureau of Agricultural Economics (Washington, D. C., October 1946), Processed.

[17]Margaret G. Reid, Relation of the Within-Group Transitory Component of Incomes to the Elasticity of Family Expenditures" (Unpublished paper—preliminary draft, 1952), p. 1.

income; hence, from survey data the probabilities of classifying farm families by atypical net cash income are great.

The effect on the income-expenditure curve of classifying families by atypical incomes was observed in a comparison of expenditure curves derived from annual data for 1941 and from data for only the first quarter of 1942. The Wartime Spending and Savings Study made such comparisons possible for different groups of nonfarm as well as farm families. Regarding the income-expenditure relation of farm families Reid states:

> The flatter regression for . . . 1942 illustrates the type of effect on income-expenditure patterns to be expected when an appreciable number of "high" income families are in "low" income positions, and conversely, "low" income families are in "high" income positions.[18]

The difference in the regressions for the two time periods of the nonfarm families was not as marked as the difference in the regressions of the farm families. These findings suggest that the shorter the income period used as a base for estimating income the greater the likelihood of classifying many families by a typical income. The seasonal character of some farm income may account in part for the greater variability in the relative income position of farm than nonfarm families.

Reid, also, studied the shifting from year to year in the relative incomes of several groups of Mid-West farm families. The degree of change in the relative income position and the coefficient of elasticity of annual family expenditures in relation to annual net cash income were found to be related. Out of this investigation Reid reaches the tentative conclusion that:

> . . . if data were available for groups of families who are experiencing no shifts in relative income that the elasticity of expenditures of the group in relation to annual incomes would be 1.0.[19]

Knowledge of the elasticity of farm family expenditures in relation to gross cash income is limited. The only investigation of this type, made by Longmore and Taylor, reported a low coefficient of income elasticity of expenditures for family living.[20] These researchers, however, did not extend their investigation to determine the relation of average family expenditures and average net cash income out of the gross cash income classes.

The relation of farm family spending to typical income is unknown. However, Friedman and Kuznets pointed out the char-

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[18]Margaret G. Reid, "Effect of Income Concept upon Expenditure Curves of Farm Families," **Conference on Research in Income and Wealth, Studies in Income and Wealth,** XV (New York: National Bureau of Economic Research, 1952), 139.

[19]Reid, "Relation of Within-Group Transitory Components of Incomes to the Income Elasticity of Family Expenditures," **op. cit.,** pp. 2.

[20]Longmore and Taylor, **op. cit.**

acteristics of a basis of classification which should yield an estimate of the average income of families composing the various classes within a group. Presumably, if families are classified by a measure which is correlated with their typical income and uncorrelated with the ups and downs from year to year in income, then within a given class the variations in disposable net cash income will tend to offset each other and the average disposable net cash income of the class for a single year will tend to represent the average typical income of the families composing the class.

If an estimate of the average typical income can be obtained, then the relation of average family expenditures and average typical income can be observed. Apparently the function of the basis of classification is to pre-sort the families so that the average income of the classes represents the difference among classes in typical income.

Each of the three bases of classification, disposable net cash income, gross cash income, and socioeconomic status, used in this investigation has some positive correlation with the family's typical income (see evidence in Part I). If these bases of classification differ in their capacity to yield a measure of the typical or average income of families composing the various classes within a group, the difference probably lies in the degree of correlation with differences among families in the year-to-year variation in income. Disposable net cash income tends to be up one year and down another, hence one would expect it as a basis of classification to be highly correlated with the variability in annual income. The extent to which classification by gross cash income and socioeconomic status are correlated with year-to-year variation in annual income is unknown.

THE PROBLEM

The assumption is that the higher the coefficient of elasticity of average expenditures in relation to average disposable net cash income the more effective the basis of classification has been in yielding for each class an average disposable net cash income which is free of the effect of the year-to-year variation in income.

The specific objectives are: (1) to determine the rate of increase in average family expenditures with an increase in average disposable net cash income when the families are ranked by disposable net cash income, (2) to determine the rate of increase in average family expenditures with an increase in average disposable net cash income when the families are ranked by two other indicants of economic level, gross cash income and socioeconomic status, and (3) to compare the expenditure-income relations obtained for the three bases of classification.

The equation used to compute the regression coefficient assumes an expenditure curve which is linear in the logarithmic scale. The equation is:

$$\log y = a + b \log x$$

where y is the annual average expenditures of the class and x is the annual average disposable net cash income of the class. This equation facilitates comparison since the regression coefficient and the coefficient of average expenditures in relation to average income are identical; hence, the coefficient of income elasticity of average expenditures is constant over the whole range of incomes.

Coefficients of Income Elasticity of Average Family Expenditures for Classifications by Three Indicants of Economic Level[21]

The coefficient of elasticity of average "residual" family expenditures in relation to average disposable net cash income is .55 for the classification by disposable net cash income. For the classification by gross cash income the coefficient of income elasticity for "residual" family expenditures is .69 and for the classification by socioeconomic status it is .91 (see Table 7).

TABLE 7—*Coefficients of Elasticity of Average Family Expenditures in Relation to Average Disposable Net Cash Income Out of the Classification By Three Indicants of Economic Level.*

Types of Family Expenditures	Classification by		
	Socioeconomic Status	Gross Cash Income	Disposable Net Cash Income
(1)	(2)	(3)	(4)
Total family expenditures			
As reported	.91	.66	.55
Adjusted to family of 3.71 persons*	.94	.67	.55
"Residual" family expenditures			
As reported	.88	.68	.55
Adjusted to family of 3.71 persons*	.91	.69	.55
"Scale items"	1.07	.60	.57
Recreation	1.48	1.05	.75
Gifts and contributions	1.82	1.29	1.01
Food			
As reported	.53	.37	.32
Adjusted to family of 3.71 persons*	.58	.39	.32
Clothing	.75	.59	.56
"All other" expenditures	1.07	.78	.63

*See page 13 for adjustment procedure used.

[21]The coefficient of elasticity of average savings in relation to average disposable net cash income is 1.38 for the classification by socioeconomic status. Spending in excess of income, resulting in negative savings in the lowest fourth of the distribution for the classifications by gross cash and disposable net cash income impaired the use of the logarithmic equation; hence, the income elasticity of savings for the classifications by income was not determined.

The magnitude of the coefficient of average "residual" family expenditures in relation to average disposable net cash income for the classification by socioeconomic status indicates that socioeconomic status as a basis of classification yields for each of the classes within the group an estimate of the average typical income that is more free of the effect of the year-to-year variation in income than does either the classification by gross cash or disposable net cash income. The relative magnitude of the coefficients, which is the method of test prescribed, indicates that classification by gross cash income is more free of the effect of the variability in income than classification by disposable net cash income. Apparently some of the variance in the latter due to the pattern of farm operating expense is eliminated when families are classified by gross cash income. The low coefficient of income elasticity of average "residual" family expenditures for the classification by disposable net cash income indicates that the time-to-time variance in the average income of the classes within the group cannot be eliminated except by using as a basis of classification some indicant of economic level which is uncorrelated with the ups and downs in annual net cash income.

When farm families are classified by an indicant of economic level which yields a reasonably good estimate of their typical income the difference in farm family spending tends to keep pace with the difference in typical income. For the classification by socioeconomic status the coefficient of income elasticity of .91 indicates that average "residual" family expenditures are a function of the average typical income of the families composing the respective classes within the group. Although the coefficient of income elasticity is high, it is not 1.0 as Reid suggested it would be if there were no shifting in the relative position of the families within the group. Some shifting from time to time in the relative socioeconomic status of families within the group is known to occur, and there also may be a lag in the adjustment of farm family expenditures to the new status position.

The most important relationship to examine is that of average "residual" family expenditures and average typical income. This category of expenditures is free of the effect of the component in Sewell's scale which influences total family expenditures and thus eliminates the major criticism which could be made of socioeconomic status as a basis of classification for the study of farm family expenditure-income relations. The category which is exclusively expenditures for the "scale items" has shown repeatedly its interrelation with the classification by socioeconomic status, but this characteristic apparently has little effect on the usefulness of socioeconomic status as an indicant of econonomic level for measuring the average typical income of the classes within the group. For each indicant of economic level the coefficient of income elasticity of average "residual" family expenditures (which exclude the effect of expenditures for the "scale items") is of the same relative magnitude as the coefficient of average total family expenditures (which include the effect of expenditures for the "scale items").

Coefficients of Income Elasticity of Average Family Expenditures for the Classification by Socioeconomic Status at Three Points in Time

The coefficient of elasticity of average "residual" family expenditures in relation to average disposable net cash income is .91 for the classification by socioeconomic status on the date of interview. The coefficient for the classification on December 31, 1949, is .85; and for the classification on January 1, 1949, it is .90 (see Table 8). Irrespective of the point in time, the classification by socioeconomic status tends to yield a relatively good estimate of the average typical income of the families composing the various classes.

TABLE 8—*Coefficients of Elasticity of Average Family Expenditures In Relation to Average Disposable Net Cash Income Out of the Classification By Socioeconomic Status at Three Points in Time*

Types of Family Expenditures	Socioeconomic Status at Different Points in Time		
	Date of Interview Summer 1950	End of Report Year December 31, 1949	Beginning of Report Year January 1, 1949
(1)	(2)	(3)	(4)
Total family expenditures			
As reported	.91	.90	.87
Adjusted to family of 3.71 persons*	.94	.92	.89
"Residual" family expenditures			
As reported	.88	.82	.88
Adjusted to family of 3.71 persons*	.91	.85	.90
"Scale items"	1.07	1.27	.81
Recreation	1.49	1.33	1.41
Gifts and contributions	1.82	1.83	2.08
Food			
As reported	.53	.41	.44
Adjusted to family of 3.71 persons*	.58	.46	.49
Clothing	.75	.80	.84
"All other" expenditures	1.07	1.11	.97

*See page 13 for adjustment procedure used.

The time-to-time variance in socioeconomic status evidently is not the type that is up one year and down another. Apparently, the level of the socioeconomic status ratings for the group moved up gradually as the families acquired the "scale items," but the relative socioeconomic position of the families within the group was comparatively stable. It is the relative stability of the socioeconomic status position of the families within the group which tends to account for the effectiveness of socioeconomic status as a basis of classification for the measurement of the average typical income of farm families.

CONCLUSIONS

1. The rate of increase in average family expenditures tends to keep pace with the increase in average disposable net cash income when families are classified by an indicant of economic level that is relatively free of the effect of the year-to-year variability in income.

2. Socioeconomic status, gross cash income, and disposable net cash income differ more in their capacity to measure the average disposable net cash income of families composing the classes within the group than in their capacity to measure the average family expenditures of the respective classes.

3. Socioeconomic status possesses the essential characteristics of a basis of classification for measuring the average typical income of the various classes within a group of farm families in greater degree than either annual gross cash income or disposable net cash income.

4. As a basis of classification, socioeconomic status is more effective in the study of farm family income-expenditure relations when it is used in conjunction with income data than when it is used in lieu of income data. Since socioeconomic status has a low correlation with the ups and downs of annual income, it provides a method of ranking families so that the variations in disposable net cash income within a class tend to average out and the mean income of the class tends to be an estimate of the average typical income of the families composing the respective classes within the group.

DEFINITION OF TERMS

Expenditures

Expenditures for Current Consumption

Two types of cash outlays for family living: (1) a cash payment for a commodity purchased or services received during the schedule year, and (2) a cash payment made on obligations due during 1949 for goods and services received prior to January 1, 1949. If the purchase price of the commodity bought or the service rendered was not paid in full, the unpaid balance was excluded from the expenditures for current consumption.

Except for payments on new dwellings and improvements to dwellings, all cash outlays for durable goods were considered current expenditures. Automobile and truck expense, both acquisition and operating, were prorated according to the per cent assigned to family use by the respondent. The remainder of the acquisition outlay for a car or truck was considered an investment in farm business.

Expense for electricity and repairs to water supply system were prorated according to per cent assigned to family use by respondent. Insurance on operator dwelling was included in family expenditures.

Expenditures for Items on Sewell's Scale

The sum of outlays for repairs and replacements on family dwelling; repairs on family water supply system; family share of car expense, both acquisition and operating; telephone, and family share of electricity expense, exclusive of installation costs; amount paid for power washer or equivalent service, refrigerator and radio including repair expense; subscription price of daily newspaper and contributions to church.

Total Family Expenditures

The sum of the expenditures for food, repairs, replacements and insurance on family dwelling, household operation, furnishings and equipment, clothing, automobile, other transportation, personal care, medical care, recreation, tobacco, education, gifts and contributions, reading and miscellaneous items.

INCOME

Gross Cash Income

The sum of gross cash farm income, net earnings from employment; net income from crafts and boarders; net rent from property; interest and dividends and regular contributions from persons not in the family.[22] Specific definition of certain items is given below:

Gross Cash Farm Income—The sum of receipts from sale of crops and livestock and crops placed under government loan, government payments in connection with farming practices, and receipts from custom work performed. No adjustment made for inventory change in crops and livestock.

Net Earning from Employment—Cash wages and salaries from all employment, odd jobs and casual work, received by the operator, his wife, or his children adjusted for occupational expense and transportation costs incurred specifically by off-farm employment. Withholdings by employer for Federal income tax, social security or group insurance, et cetera, not deducted in computing net earning from employment.

Net Income from Crafts—Total cash receipts from sale of crafts less cash expenditures for materials used in craft production.

[22]Other sources of cash income were reported by the 223 families in the Rural Spending Ways Study who were excluded from the sample selected for this investigation.

Net Income from Boarders—Total cash receipts from boarders less cost of meals served, computed on basis of cash expenditures for food per meal, per year-equivalent person.

Disposable Net cash Income

The sum of net cash farm income and the other components of cash income enumerated under gross cash income, less federal and state income taxes. Specific definition of net cash farm income is given below:

Net Cash Farm Income—Gross cash farm income less cash outlays in 1949 for farm expenses including: cash rent; real and personal property taxes; interest on farm mortgages and other indebtedness connected with farm business; insurance on equipment, crops, livestock, and farm buildings, except operator dwelling; labor costs, including contract work and machine hire; materials, feed and livestock; veterinarian and breeding fees; repairs to farm machinery, motor vehicles, and farm buildings except operator dwelling; operation of farm machinery and motor vehicles, including that portion of the automobile and truck operation expenses assigned by the respondent to farm use; farm organization dues, and payments on farm expenses incurred before January 1, 1949.

Purchase and sale of farm equipment and motor vehicles did not enter into computation of farm income, but were considered as changes in assets. No adjustment was made for depreciation on farm equipment and buildings.

APPENDIX

Sewell's Scale[23]

Socio-economic Scale

a. What is type of house construction? Painted frame, brick, asbestos shingle, concrete block, asphalt siding, unpainted frame, log, other_____			3	5
b. Do you have water piped into house?	N____	Y____	4	8
c. Do you have a power washing machine?	N____	Y____	3	6
d. Do you have a radio in the house?	N____	Y____	3	6
e. Do you have a telephone?	N____	Y____	3	6
f. Do you have a car (other than truck)?	N____	Y____	2	5
g. Do you take a daily newspaper?	N____	Y____	3	6
h. Do you have electricity?	N____	Y____	-	8
If No, What kind of lamps do you use? Oil_____ Pressure_____			3	6
i. What kind of refrigerator do you have? None_____ Ice_____			3	6
Gas_____ Electric_____ Kerosene_____ Mechanical_____			-	8
j. How many days a month does your church hold meetings?				
Does female head attend ¼ of days or more?	N____	Y____	2	5
Does male head attend ¼ of days or more?	N____	Y____	2	5
k. How many rooms do you live in?_____ R		2+		7
How many persons live here?_____ P		1+	3	5
l. What is highest grade of school completed by wife?				
College: 1 year or more			-	8
High school: uncompleted, completed			6	7
Elementary school: uncompleted, completed			2	4
m. What is highest grade of school completed by husband?				
College: 1 year or more			-	8
High school: uncompleted, completed			6	7
Elementary school: uncompleted, completed			3	5
n. Total				

[23] Instructions for use—see **Family Food Consumption in Three Types of Farming Areas of the South. I. An Analysis of 1947 Food Data,** pp. 42-46.